

ANTELOPE, DEER, BIGHORN SHEEP AND MOUNTAIN GOATS: A GUIDE TO THE CARPALS

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ABSTRACT.—Remains of antelope, deer, mountain goat, and bighorn sheep appear in archaeological sites in the North American west. Carpal bones of these animals are generally recovered in excellent condition but are rarely identified beyond the classification "small-sized artiodactyl." This guide, based on the analysis of over thirty modern specimens, is intended as an aid in the identification of these remains for archaeological and biogeographical studies.

RESUMEN.—Se han encontrado restos de antilopes, ciervos, cabras de las montañas rocosas, y de carneros cimarrones en sitios arqueológicos del oeste de Norte América. Huesos carpianos de estos animales se recuperan, por lo general, en excelentes condiciones pero raramente son identificados más allá de la clasificación "artiodactilos pequeño." Esta guía, basada en un análisis de más de treinta especímenes modernos, tiene el propósito de servir como ayuda en la identificación de estos restos para estudios arqueológicos y biogeográficos.

RESUME.—On peut trouver des ossements d'antilopes, de cerfs, de chèvres de montagne et de mouflons des Rocheuses, dans des sites archéologiques de la région ouest de l'Amérique du Nord. Les os carpeins de ces animaux, généralement en excellente condition, sont rarement identifiés au delà du classement d'"artiodactyles de petite taille." Le but de ce guide basé sur 30 specimens récents est d'aider à identifier ces ossements pour des études archéologiques et biogéographiques.

Four genera of relatively small artiodactyls have roamed the Holocene landscapes of western North America. The remains of antelope (*Antilocapra americana*), deer (*Odocoileus hemionus* and *O. virginianus*), mountain goats (*Oreamnos americanus*), and bighorn sheep (*Ovis canadensis*) appear in various archaeological and paleontological deposits in the West (e.g., Grayson 1985, 1988; King 1950; Sinclair 1904). Throughout western North America, the distributions of these animals overlap, at least in part. In areas of the Great Basin, for instance, antelope, deer and bighorn sheep have coincident distributions (Hall 1981). These three genera are typically found together in archaeological sites in the Great Basin (e.g., Grayson 1988) and in eastern Washington (e.g., Livingston 1985). On the northwest coast, the distributions of deer, bighorn sheep, and mountain goat overlap (Hall 1981) and all may be represented in one archaeological site (King 1950).

Post-cranial remains of these genera are often difficult to distinguish. In addition, the condition of archaeological faunal material and incomplete comparative collections often preclude the generic or specific identification of the bones in question. Several zoologists and archaeologists have described criteria for identification of elements of these genera (e.g., Gilbert 1980; Hildebrand 1955; Lawrence 1951; Sandefur 1977), but with one exception (Sandefur 1977), carpals are not included in available guides.

Carpals are small dense bones that make up the joint between the lower fore limb and the metacarpals (Fig. 1). In artiodactyls, this joint is tightly bound together by soft tissue. Because carpals are dense, they do not deteriorate as rapidly as other elements after the death of the animal (Brain 1981). They occur frequently in archaeological deposits but are often lumped under the taxonomic category "small-sized artiodactyl" during analysis. The identification of these elements to genus will aid subsistence studies about the variable treatment of carcasses. Additionally, biogeographical studies of these genera (e.g., Lyman 1988) may be advanced by the use of this tool.

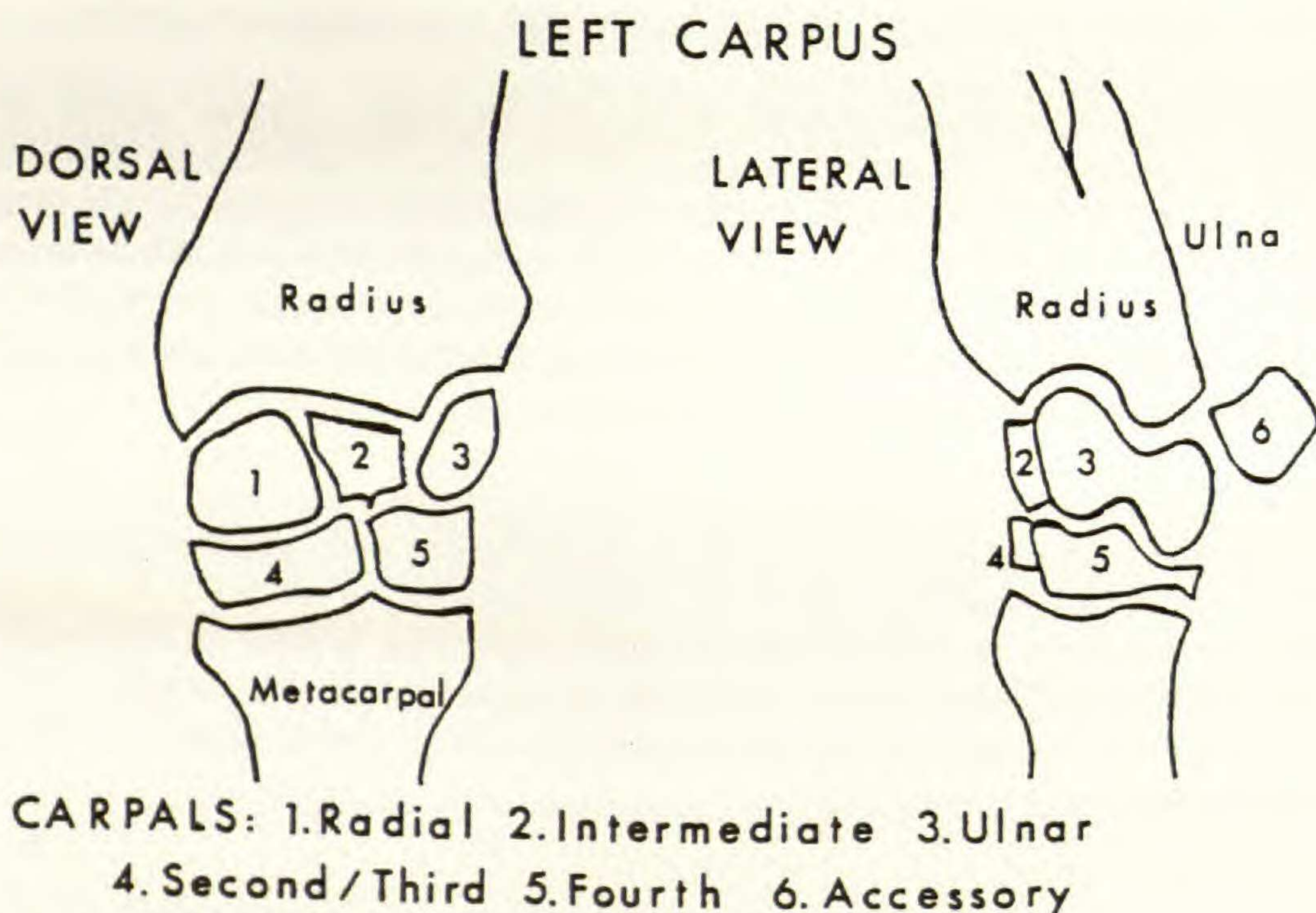
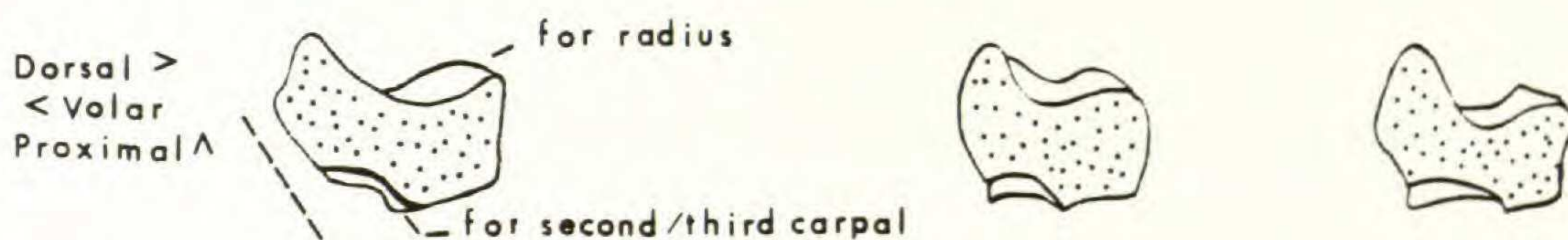


FIG. 1.—Relationship of various carpals to the radius and metacarpal in artiodactyls.

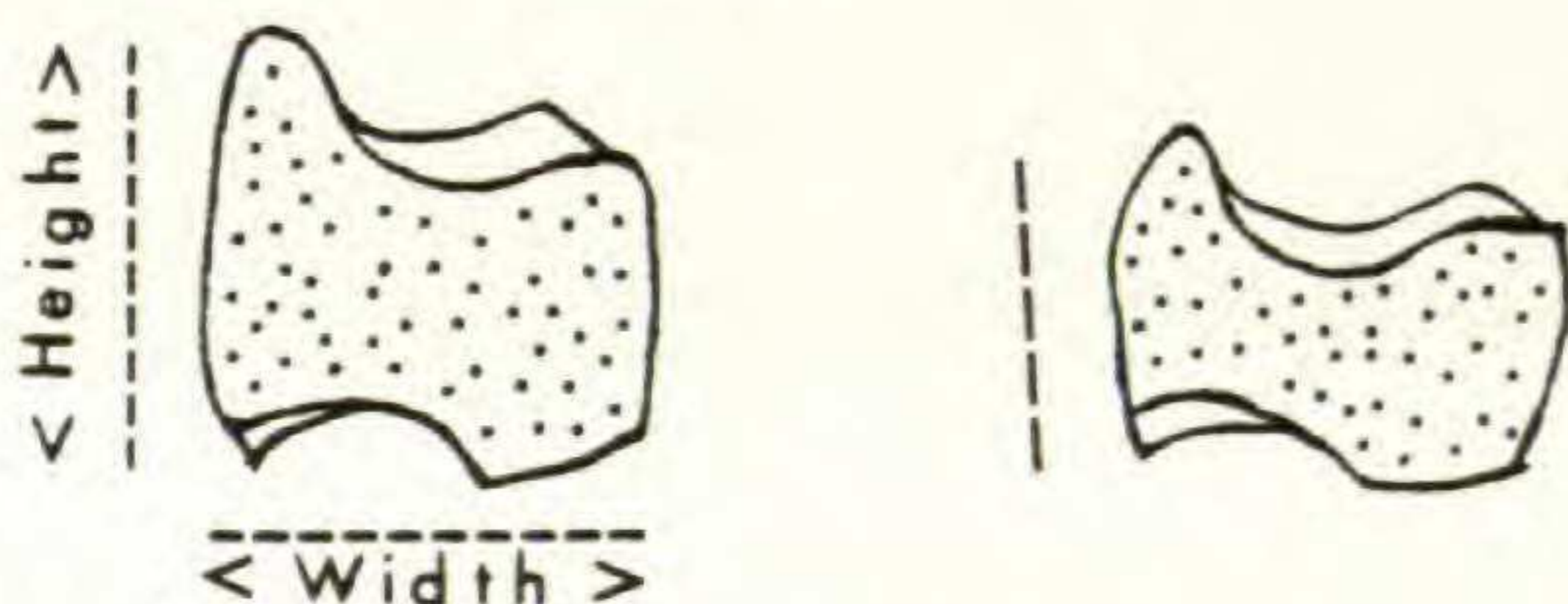
This guide is intended for use in conjunction with comparative skeletons for the identification of carpals recovered from archaeological and paleontological deposits. Few analysts have extensive collections of artiodactyls available and comparison of one archaeological carpal with one modern specimen of each genus may not allow the secure identification of the archaeological specimen. The purpose of this guide is to illustrate the characteristics that appear on carpals of various genera, but which might not be evident when examining single specimens. I initially utilized 31 skeletons from the collections of the Museum of Comparative

Zoology at Harvard University, the Thomas Burke Memorial Washington State Museum, and private collections to determine useful and valid distinguishing criteria. Carpals from twelve of these were used for the drawings in Figures 2-10. The drawings were compared with an additional set of seven modern specimens. Further analyses by others may bring to light additional distinctive criteria and require revisions in this guide.

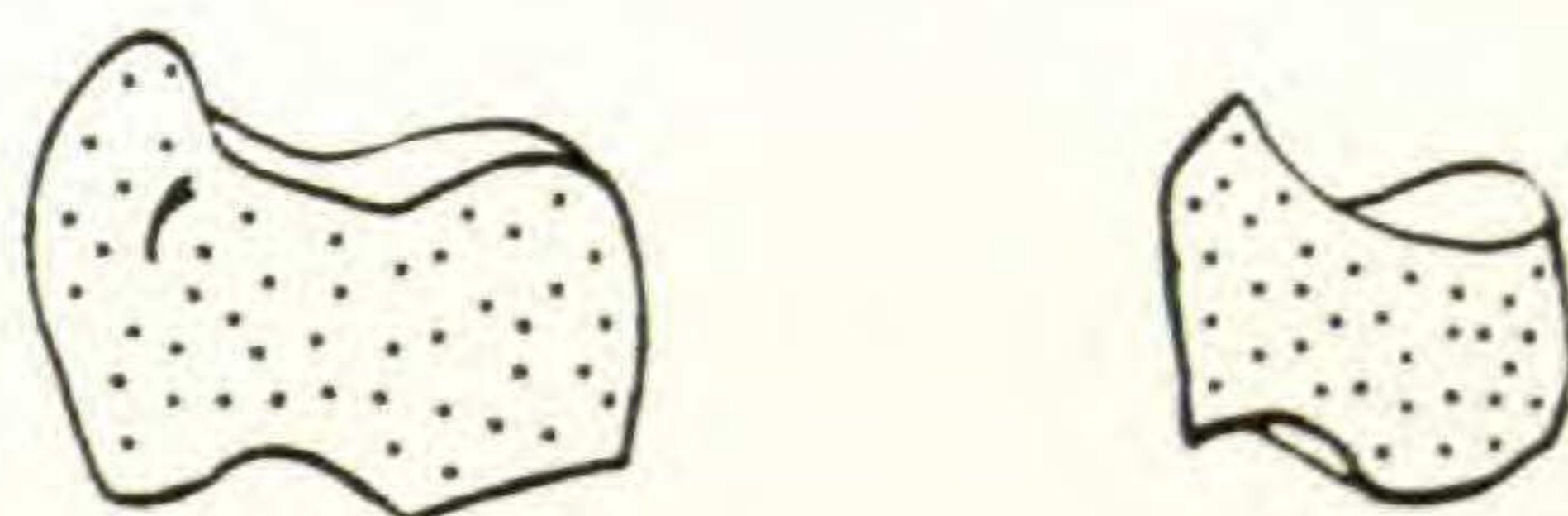
ANTILOCAPRA AMERICANA



ODOCOILEUS HEMIONUS

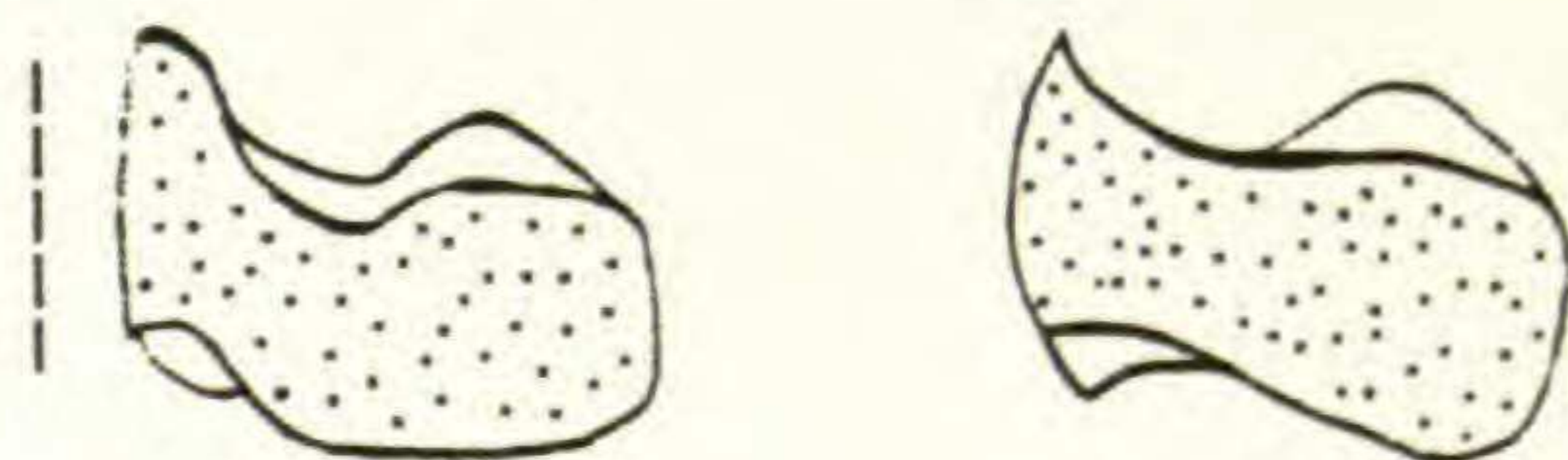


ODOCOILEUS VIRGINIANUS



1. Volar border slopes in antelope, is nearly vertical in deer and mountain goat, and is rounded in sheep.
2. The carpal in lateral view is narrowest in relation to height in deer, widest in relation to height in sheep and goat.

OREAMNOS AMERICANUS



OVIS CANADENSIS

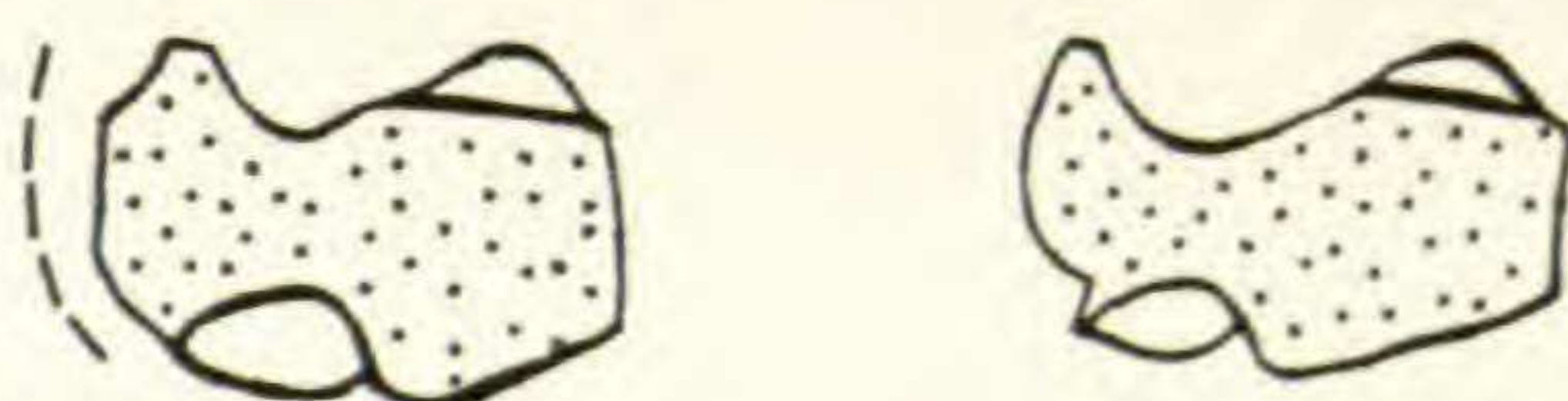


FIG. 2.—Radial carpal, lateral view.

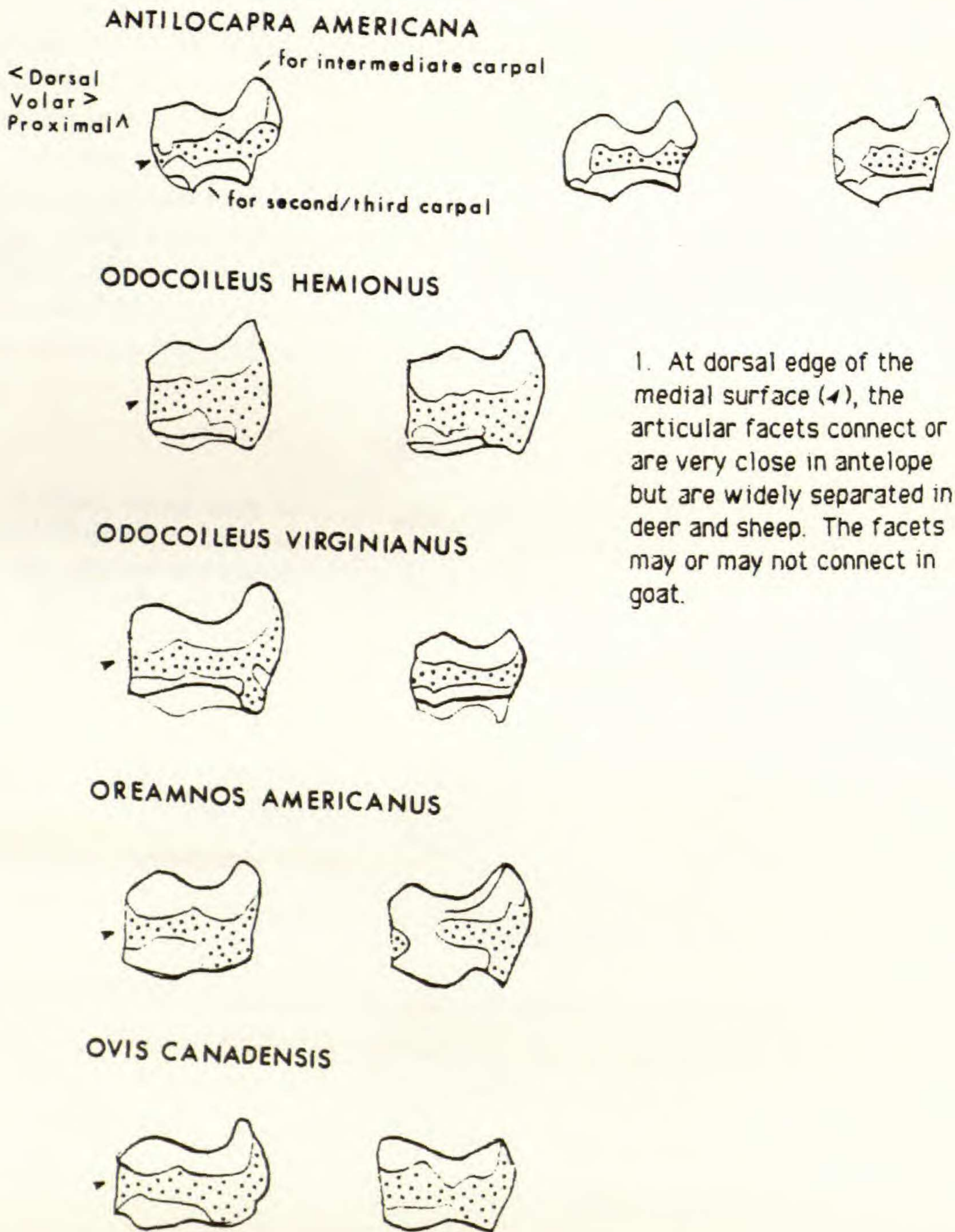


FIG. 3.—Radial carpal, medial view.

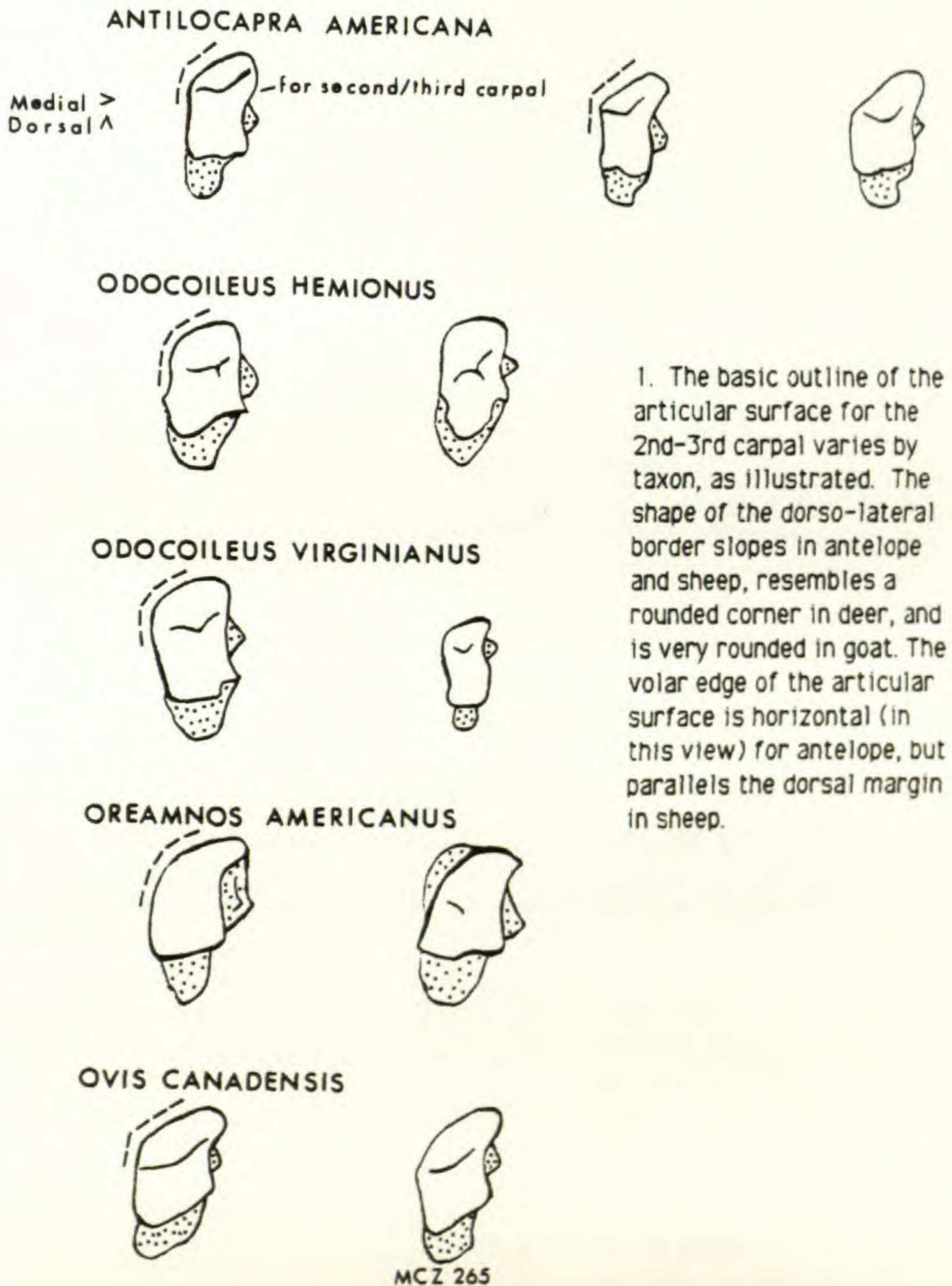
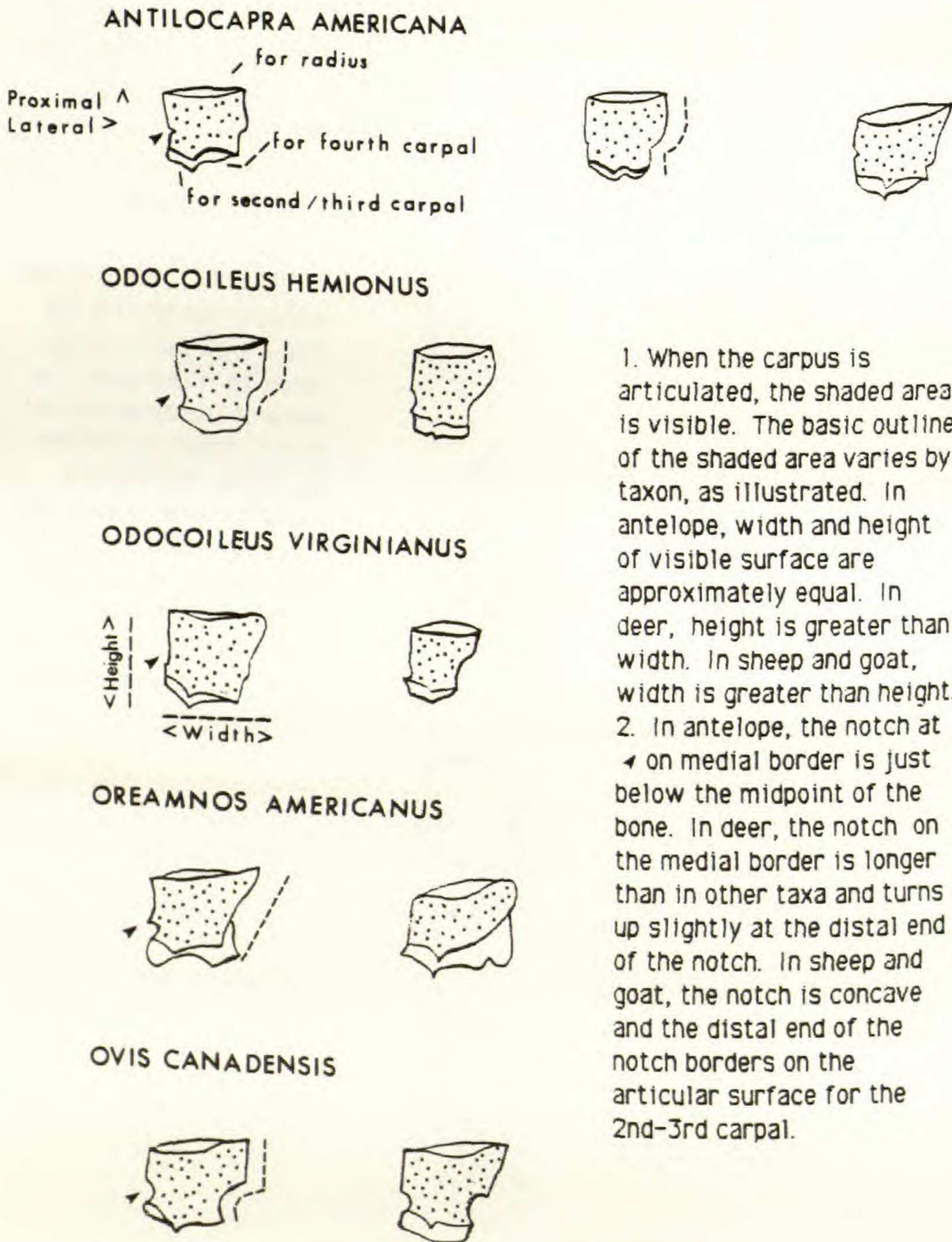


FIG. 4.—Radial carpal, distal view.



1. When the carpus is articulated, the shaded area is visible. The basic outline of the shaded area varies by taxon, as illustrated. In antelope, width and height of visible surface are approximately equal. In deer, height is greater than width. In sheep and goat, width is greater than height.

2. In antelope, the notch at \blacktriangleleft on medial border is just below the midpoint of the bone. In deer, the notch on the medial border is longer than in other taxa and turns up slightly at the distal end of the notch. In sheep and goat, the notch is concave and the distal end of the notch borders on the articular surface for the 2nd-3rd carpal.

FIG. 5.—Intermediate carpal, dorsal view.

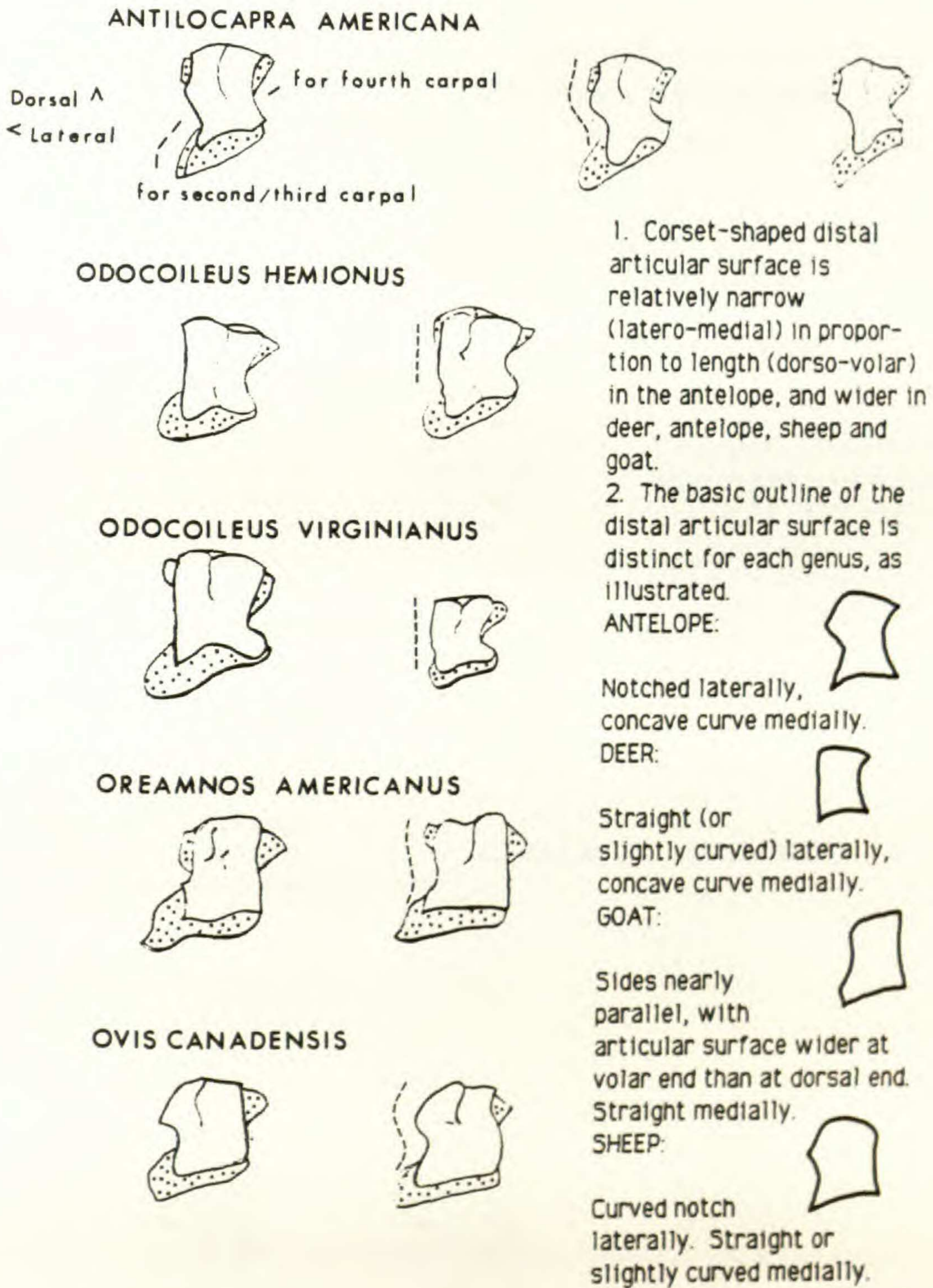


FIG. 6.—Intermediate carpal, distal view.

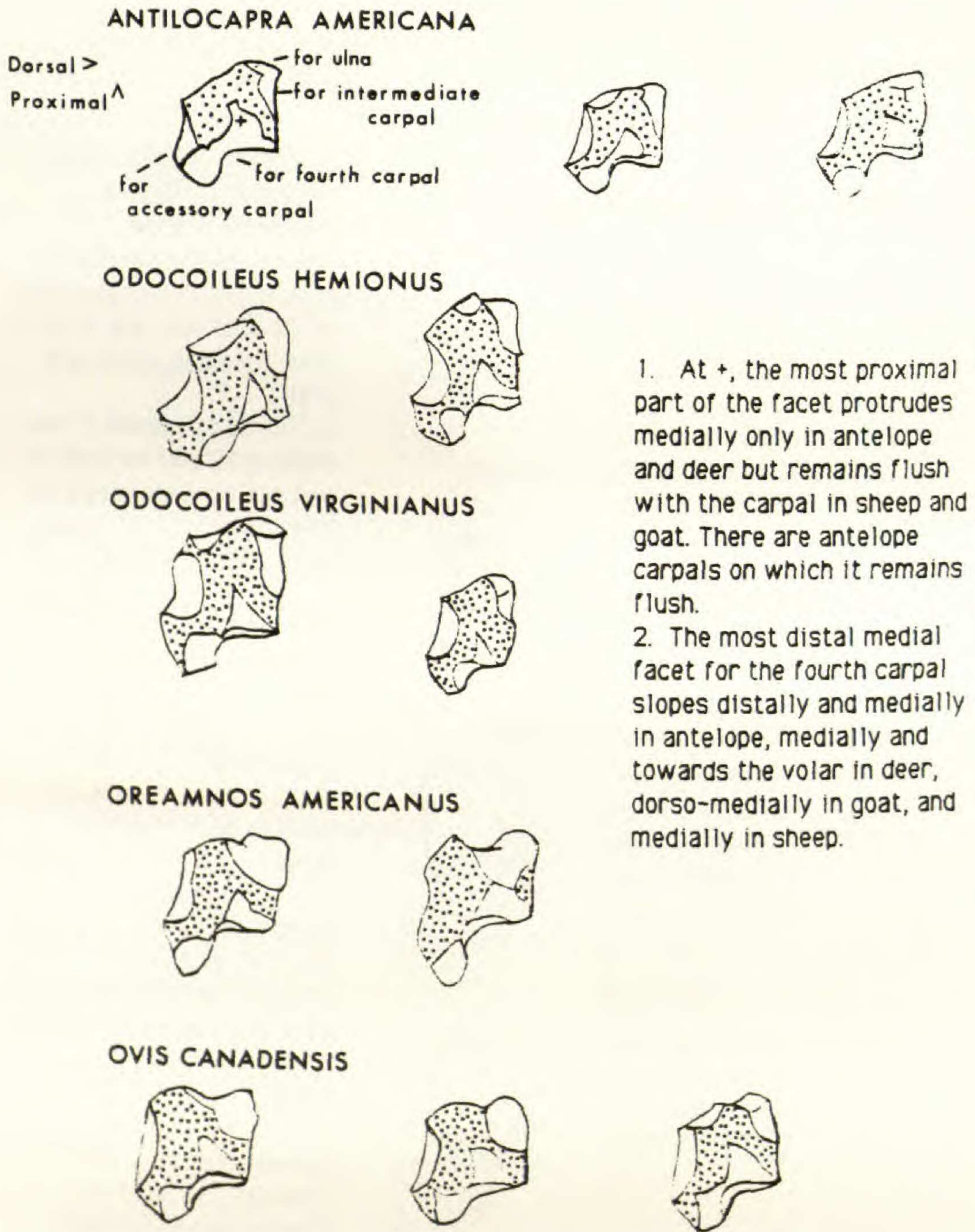


FIG. 7.—Ulnar carpal, medial view.

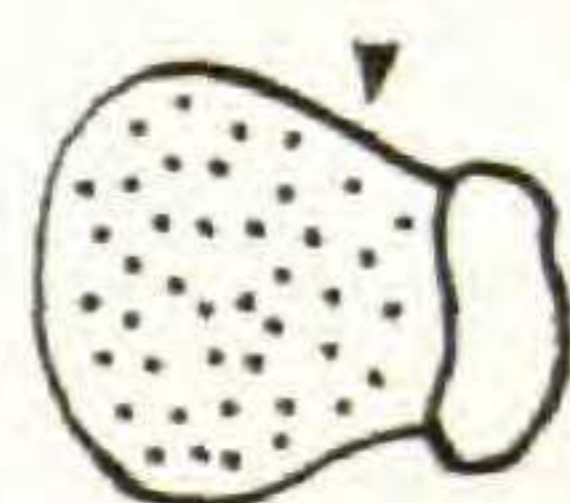
ANTILOCAPRA AMERICANA



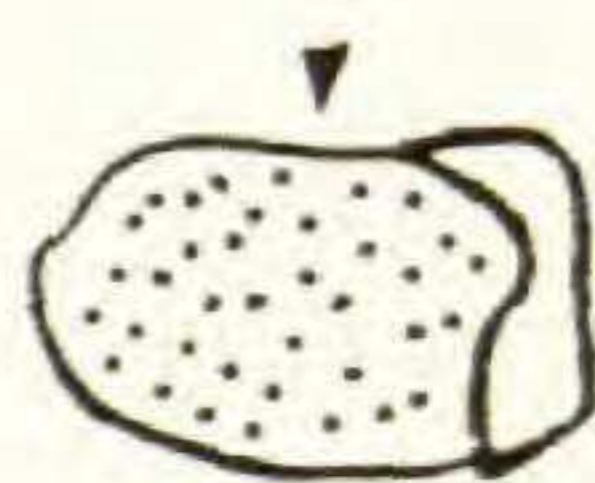
ODOCOILEUS HEMIONUS



ODOCOILEUS VIRGINIANUS



OREAMNOS AMERICANUS



OVIS CANADENSIS

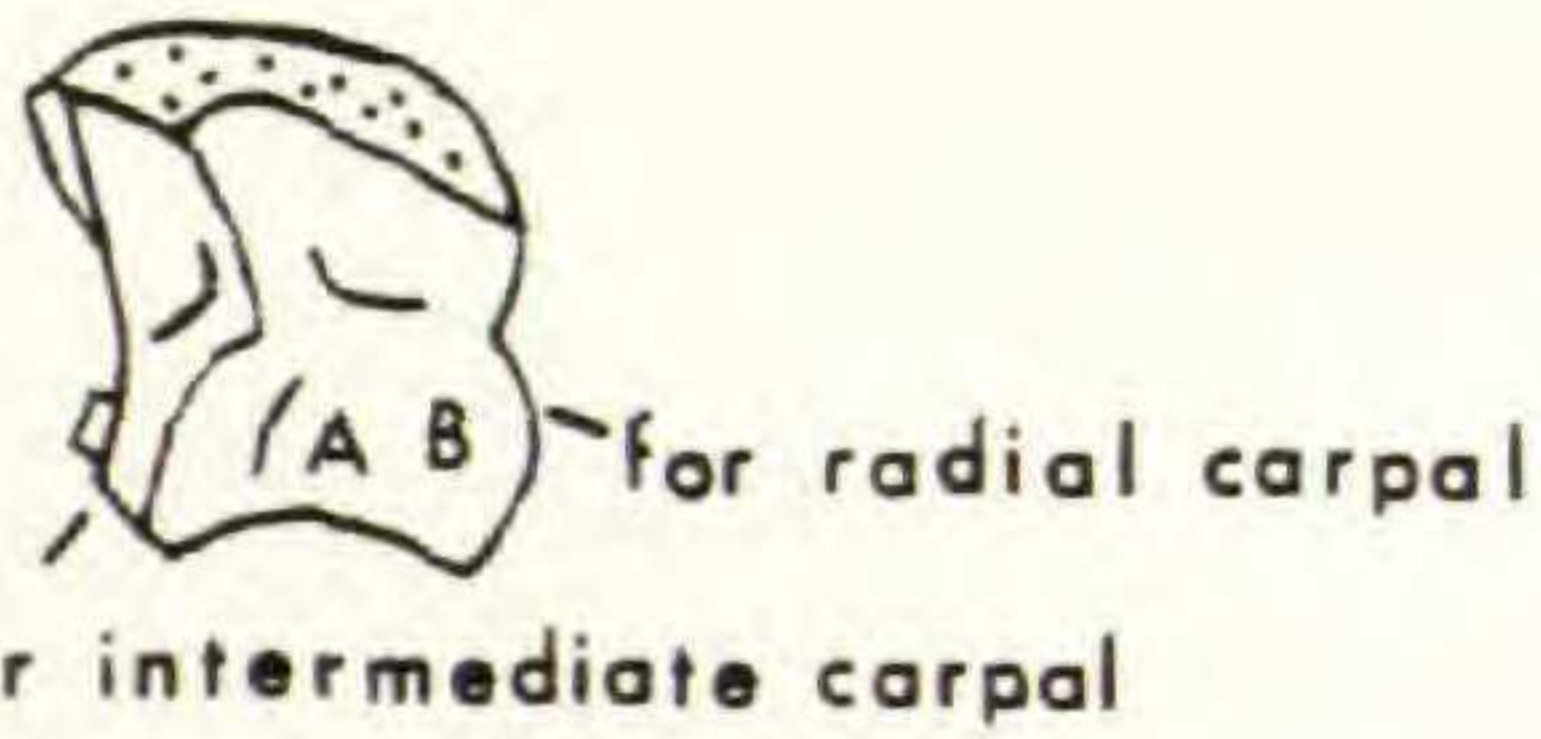


1. The basic outline of the carpal in medial view varies by genus, as illustrated.
 2. Mid-section (▴) in antelope is depressed, so that dorsal and volar ends are curving towards each other. This curvature is only very slight in the other genera.

FIG. 8.—Accessory carpal, medial view.

ANTILOCAPRA AMERICANA

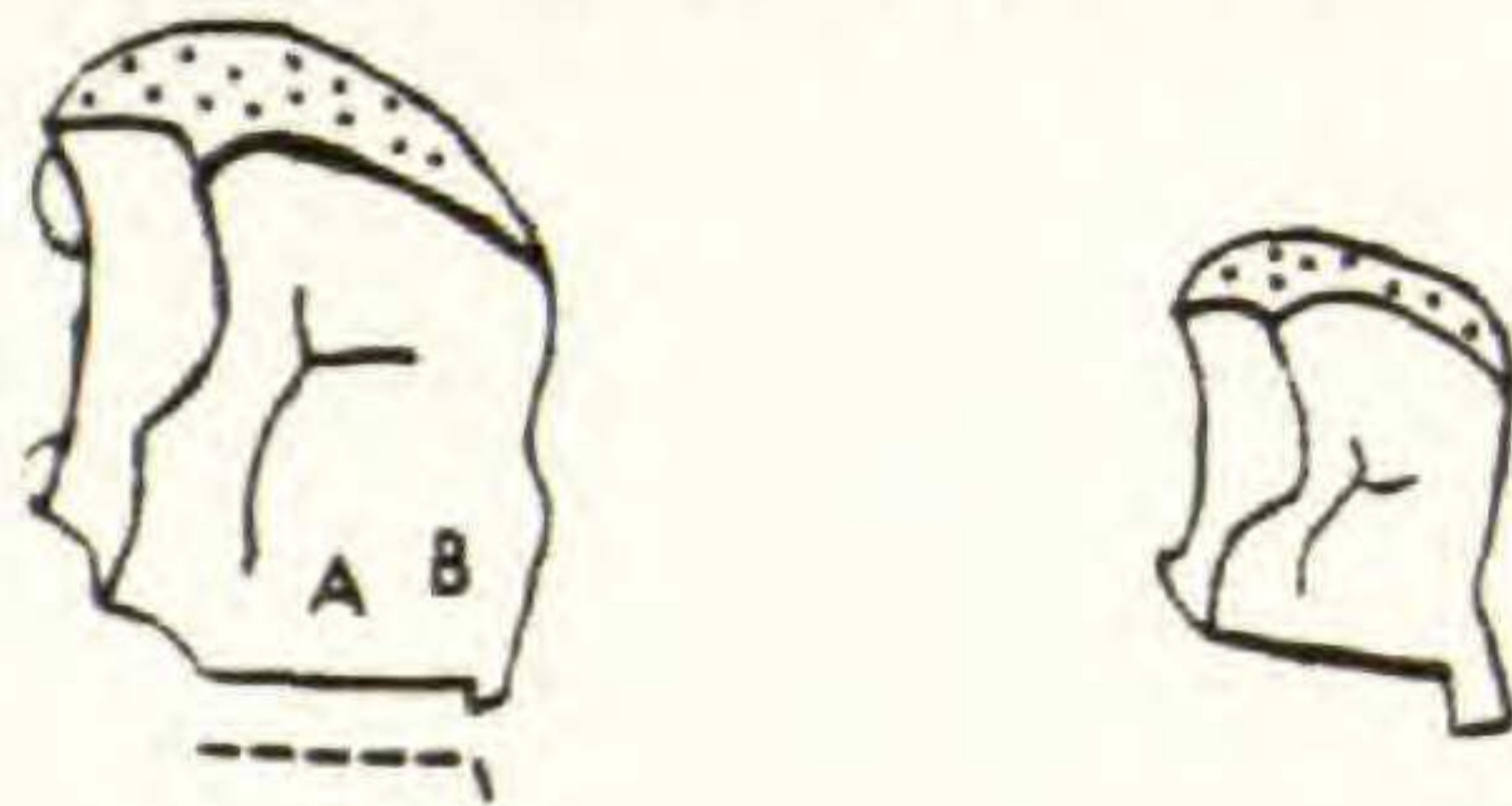
Dorsal ^
Volar v
Medial >



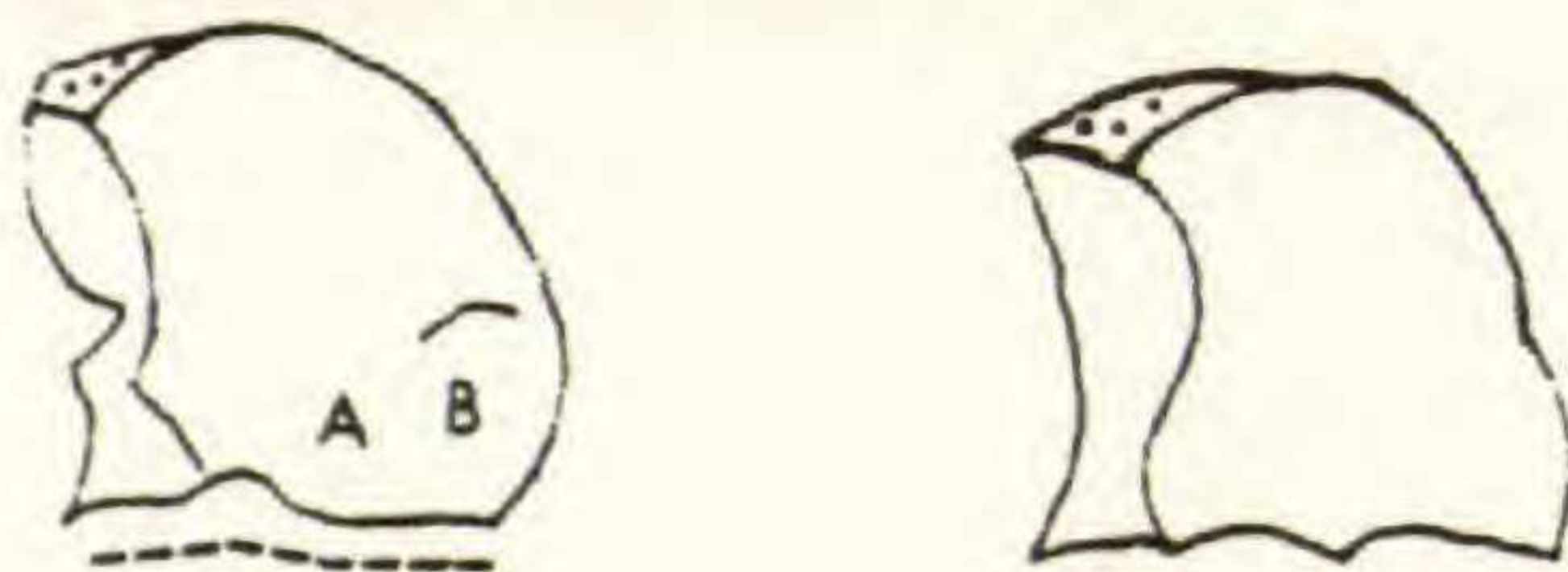
ODOCOILEUS HEMIONUS



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OREAMNOS AMERICANUS



OVIS CANADENSIS



1. The volar margin is concave in antelope, fairly straight in deer, horizontal in goat, and sloping and notched in sheep.

2. All are approximately square in basic outline, but in goat and sheep, the articulation for radial carpal is approximately as wide (latero-medially) as it is deep (dorso-volar). In antelope and deer, the articulation is deeper than it is wide.

3. The articular surface for the radial carpal tends to be flatter in goat and sheep.

4. In antelope, part B of the articular surface slopes so that it is much higher than A. In deer and sheep, A and B are approximately the same height.

FIG. 9.—Second/third carpal, proximal view.

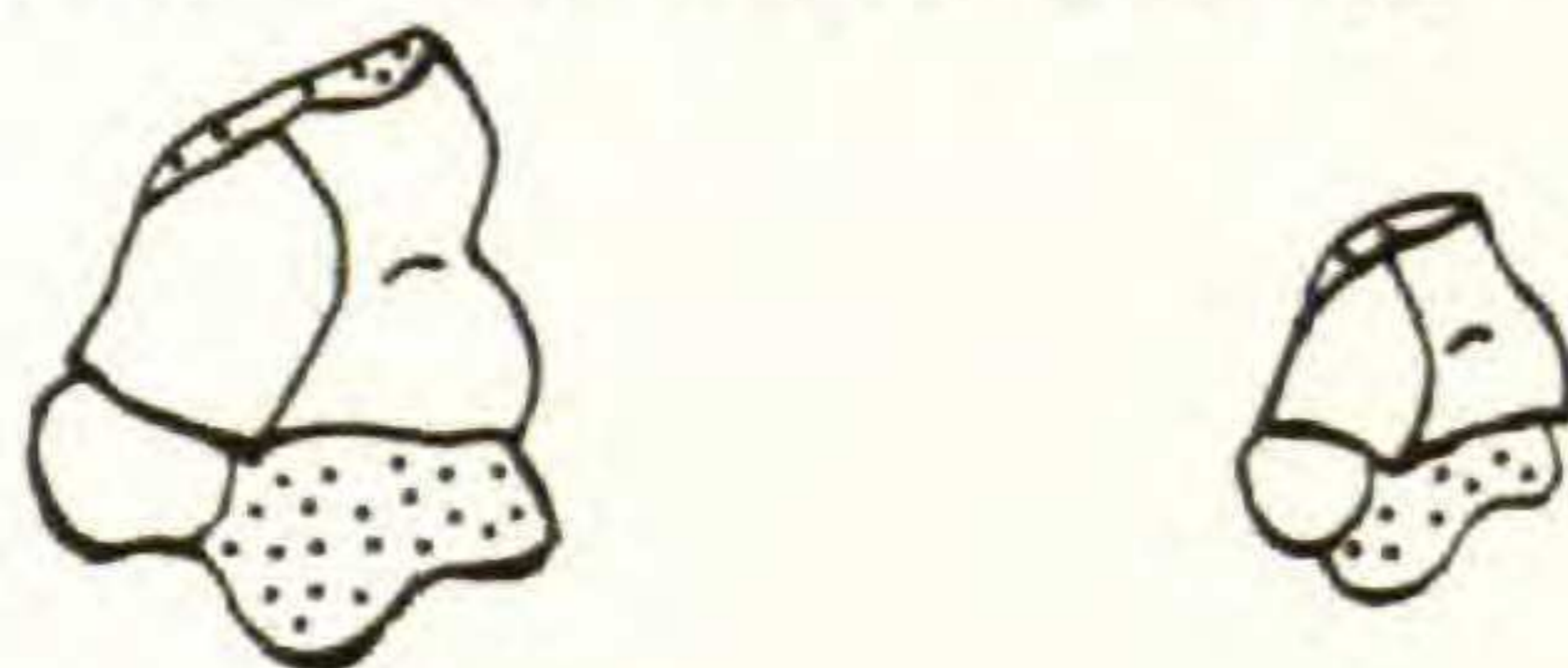
ANTILOCAPRA AMERICANA



ODOCOILEUS HEMIONUS



ODOCOILEUS VIRGINIANUS



OREAMNOS AMERICANUS



OVIS CANADENSIS



1. The shape of the volar border varies. In antelope, there may be a rounded notch adjacent to the articular surface at A. In deer, the most volar part of the volar margin is rounded and close to center (B). In mountain goat and sheep, the most volar extension is off-center, and a notch is present at A.

FIG. 10.—Fourth carpal, proximal view.

Various views of at least two each of all six carpals illustrate variation within and between the five species (Figures 2-10). Male and female are represented for each species, with the exception of mountain goat, for which specimens are either female or gender unknown. No attempt has been made to determine species-level criteria for the deer. All the specimens are from the left side. Articular surfaces on each are indicated by white: all other surfaces are shaded. Anatomical terminology is from Getty (1975) to allow consistency and eliminate confusion with human osteology terms (Table 1). Taxonomic nomenclature follows that of Jones *et al.* (1986).

TABLE 1.—Synonyms used for Carpal Bones (after Getty 1975).

Radial carpal	os scaphoideum	navicular	scaphoid
Intermediate carpal	os lunatum	semilunar	lunate
Ulnar carpal	os triquetrum	triangular	cuneiform
Accessory carpal	os pisiforme	pisiform	
Second carpal	os trapezoideum	trapezoid	lesser multangular
Third carpal	os capitatum	capitate	magnum
Fourth carpal	os hamatum	hamate	unciform

In the Artiodactyls, the second and third carpals fuse to form a single element. An intermedioradial carpal and a first carpal are present in other mammals (Getty 1975).

ACKNOWLEDGEMENTS

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BOOK REVIEW

Recherches Amerindiennes au Quebec, Vol. XVIII No. 1, Printemps 1988: La santé en transition. (Amerindian Research in Quebec, 18(1), Spring 1988: Health in Transition). Recherches amerindiennes au Quebec, 6742 Saint Denis, Montreal, Quebec H2S 2S2, Canada. Pp. 99. \$7.00 (this issue), \$20.00 (regular annual subscription).

"Recherches Amerindiennes au Quebec" is a journal devoted to the dissemination of information on the Amerindians of Quebec, and to research by Quebec authors on Amerindians. Articles are published in French only, but English abstracts are provided at the back of each issue (since 12(2): 1982). Each issue has a primary theme but may also include short articles on unrelated topics. The journal has been published quarterly since 1971. It is indexed in "Abstracts in Anthropology," "Historical Abstract," "America: History and Life," and "Point de repère."

The issue "La santé en transition" is edited by Robert Larocque, Anthropology Department, University of Montreal. The seven main articles were selected to present several aspects of the relationship between diseases and cultural evolution, with a focus on the study of evidence from skeletal remains.

The first two articles discuss the health status of Amerindian populations in the transitional period of first contact with Europeans. Larocque concludes that disease had a negligible effect, in comparison to the disruption of social order, in the process of colonization. Gagné examines the high infant mortality rate at a Jesuit mission during the colonial period, and finds that malnutrition and